

The Economic Costs of Cigarette Smoking

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THE HEALTH HAZARDS of cigarette smoking are well established, as evidenced by the 1964 report of the Surgeon General's Advisory Committee and the 1967, 1968, and 1969 reports to Congress by the Public Health Service (1-4). An important part of this evidence is represented by several major prospective studies of large population segments. These studies have revealed a far greater incidence of early death among smokers than among their nonsmoking counterparts. The evidence is consistent for major groups and for both sexes, and the health hazard increases with greater exposure to smoking.

No attempt has yet been made in the United States to use data from these studies to assess another important part of the smoking problem—the magnitude of economic losses which smoking engenders. The incidence of sickness and death caused by or contributed to by cigarette smoking obviously drains our economy heavily by diverting scarce health resources

from other needs and by reducing national economic production through early death and excess morbidity.

Canadian Study

A report issued by the Canadian Department of National Health and Welfare presents the estimated cost of certain consequences of cigarette smoking in Canada (5). My paper reviews the report and assesses its applicability to the U.S. situation.

The Canadian study singled out four diseases—lung cancer, coronary heart disease, chronic bronchitis, and emphysema—and fires for measurement of economic costs from smoking. The diseases were selected on the basis of a 6-year study of Canadian recipients of veterans' pensions (6). Among this study population, the differences in mortality rates between smokers and nonsmokers were particularly pronounced for the four diseases. Findings to the same effect were reported in a Public Health Service publication (3). The Canadian costs were classified on a fourfold basis: (a) costs of providing medical care, (b) income lost because of illness, (c) future income foregone because of death, and (d) value of property lost in fires caused by smoking.

For the analysis of the Canadian data, first the total costs were estimated according to the methodology developed and applied by

Rice (7). Next, "attributability" percentages were developed to represent the proportion of total costs of the diseases considered attributable to smoking. The percentages were developed algebraically from the mortality ratios of a major U.S. prospective study, often referred to as the Hammond study (8). Table 1 shows these percentages by age, sex, and disease. Finally, the total costs for each of the diseases were multiplied by the applicable attributability percentages and the resulting costs were totaled (table 2).

Two difficulties are inherent in the use of attributability ratios which readers should bear in mind. One is that the data on which the ratios are based are necessarily imprecise, and the other is that the excess morbidity and mortality associated with cigarette smoking contain instances where cigarettes may play a coincidental rather than a causal role. It is thus somewhat misleading to call the total excess a "consequence" of smoking; it would be more accurate to say "associated" with smoking.

There is no need to labor the limitations of the data. The Canadian study drew upon the largest of the seven major prospective studies which link cigarette smoking to excess death and disability. This and other studies have been subjected to intense critical attention. The Surgeon General's Ad-

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visory Committee discussed them at length in its 1964 report (1). The committee reviewed such questions as the study populations used, the "nonresponse" biases to be found in the studies, and the stability of their mortality ratios. Its judgment was to accept the data.

Prospective studies have shown findings consistent with one another, and this consistency supports confidence in their results. Even with this similarity of findings, however, minor differences in mortality rates between one study and another can result in significant differences in economic costs. For example, coronary heart disease is a major cause of death, especially early death in the productive years of life when the loss of future income is most significant. In this case, even minor differences in mortality ratios from one study to another make an appreciable difference in costs of coronary disease because of the large number of deaths involved and because of the large economic loss from premature death. The Canadian study might have improved if the results of two or more prospective studies were used to obtain a range in costs.

Evidence of excess morbidity associated with smoking is important to the development of costs, since smoking takes a heavy toll here as well as in mortality. Only one major study has been conducted to date which sought to measure the smoking-illness relationship (9). Thus, in this area of concern, the results of several studies are not available to check the consistency of findings.

The Public Health Service's 1967 report (2) anticipated the problem of assigning causal and noncausal relationships to excess morbidity and mortality as follows:

Once the magnitude of the excess is identified the problem becomes one of determining (1) how much of the

Table 1. Canadian attributability percentages for deaths from smoking-associated diseases

Disease and age group (years)	Percent men	Percent women
All deaths:		
35-44.....	35.5	5.0
45-54.....	42.5	7.6
55-64.....	32.4	6.0
65-74.....	14.1	1.4
75 and over.....	6.9	0.0
Lung cancer:		
45-64.....	79.8	27.1
65 and over.....	77.4	5.9
Coronary disease:		
45-54.....	51.0	24.1
55-64.....	31.6	18.2
65-74.....	13.9	3.2
75 and over.....	6.1	1.6
Chronic bronchitis and emphysema:		
45-64.....	76.1	55.3
65 and over.....	77.1	35.0

SOURCE: reference 5a.

Table 2. Canadian estimates of economic costs of smoking-associated diseases and fires

Item	Costs (millions)
Mortality:	
Lung cancer.....	\$56
Coronary disease.....	201
Chronic bronchitis and emphysema.....	21
Morbidity, all diseases.....	96
Fires.....	13.5
Total.....	387.5

excess would not have occurred if it had not been for cigarette smoking and (2) how much would have occurred anyhow. It should be noted that much of the excess has already been identified as belonging in the first category. Of the remainder, little of the excess has been clearly identified as belonging in the second category—that is, not caused by smoking. With most of that remainder there is uncertainty as to the category in which it belongs.

In the Canadian study the following costs were omitted from the analysis for lack of satisfactory data:

1. Paramedical and ambulance services as well as drugs and laboratory services not provided as part of hospital services.

2. Forest fires caused by smoking and protection against all types of fires.

3. Toxic effects, primarily in children, from eating tobacco. (A special study showed that 656 persons in Canada, almost all children, suffered tobacco poisoning in 1966.)

4. Accidents and other property loss caused by smoking (excluding fires).

The omissions enumerated are economically insignificant compared to the omission from the Canadian study of the economic costs of mortality arising from diseases other than lung cancer, coronary heart disease, chronic bron-

chitis, and emphysema. Although these are four diseases in which mortality rate differences are greatest, they account for only two-thirds of the total excess mortality associated with cigarette smoking. Thus the estimate of \$278 million as the total mortality cost (table 2) would have been increased to \$417 million if this had been calculated in the same manner as the estimate for morbidity costs, which did include all excess illness associated with smoking.

Problems of analysis are not unique to the development and use of attributability percentages. Studies which derive estimates of the economic costs of diseases also have many basic assumptions and issues that have been discussed in the literature. The cost of disease can be divided into direct and indirect components. Rice (7a) classified direct costs of illness as "expenditures for prevention, detection, treatment, rehabilitation, research, training, and capital investment in medical facilities." Indirect costs represent the sum of the loss of income due to morbidity and the present value of future loss of income due to premature mortality. Rice discussed extensively the approaches to measuring direct and indirect costs and the assumptions involved.

Indirect costs are more likely than direct costs to contain errors. Some major conceptual and measurement problems of indirect costs are the treatment of transfer payments and taxes, the work of housewives, the appropriate measure of output loss, the choice of assumptions regarding full-time or less than full-time employment, and the choice of a discount rate. The intensive investigation of these issues is important to the development of estimates of the costs of smoking, since for smoking-related diseases indirect costs are typically larger in magnitude than direct costs. For example, Rice (7b)

showed the following economic cost percentages:

Diagnosis	Direct expenditures	Indirect costs	
		Morbidity	Mortality
Neoplasms.....	12	8	80
Diseases of the circulatory system.....	11	14	75
Diseases of the respiratory system.....	21	43	36

U.S. Economic Costs

I have applied the procedures and basic data from the Canadian study to the United States, although such a procedure is subject to the numerous qualifications previously discussed. Table 3 is an extrapolation of costs from the Canadian study to the United States in 1966, based on the approximate 10 to 1 relationship in gross national product between the United States and Canada.

The question arises as to how the U.S. dollar costs of cigarette smoking compare with the dollar income accounted for by the tobacco industry. Such a direct dollar comparison would be subject to several important qualifications:

- If smoking were to decline,

the resources of the tobacco industry would be temporarily impaired as they are converted to other uses; however, the health resources employed in treating smokers would be permanently restored to the economy.

• Dollars represent only a partial measure of the hardships imposed by smoking. If people are to continue smoking, society must accept the family and personal hardships entailed by death and disease, and these cannot be represented adequately in economic terms. On the other side, there are certain nonquantifiable aspects to tobacco consumption and production—the gratification which smokers obtain from cigarettes, for example, and tobacco's cultural place in our society. Such considerations, however, are surely secondary to the health aspects of smoking.

Data have long been collected and reported on the economic importance of the cigarette industry. "Smoking, Tobacco, and Health" (10), a recent publication of the National Clearinghouse for Smoking and Health, presents the following 1966 estimates of the

Table 3. Extrapolation of costs from Canadian study to the United States in 1966

Item	Costs (millions)
Canadian mortality costs of four diseases ¹	\$278
Total Canadian mortality costs (adjustment factor to extrapolate to all diseases $\$278 \times 1.5$) ²	417
Canadian costs of morbidity and fires ¹	109.5
Total Canadian costs ³	526.5
Total United States costs ⁴	5,265

¹ From table 2.

² Based on a computation which showed that deaths from the four diseases costed in the Canadian study represent approximately 67 percent of the total number of excess deaths from smoking. (Calculated from the Hammond study (8).)

³ The figure for total Canadian costs is not complete due to the four exclusions listed in the text.

⁴ A multiplier of 10 was used to adjust Canadian costs to U.S. costs since for many years the relationship of GNP between the United States and Canada has been about 10 to 1. Also cigarette consumption levels for major age and sex groups are comparable between the two countries and thus partially validate the use of this multiplier.

economic importance of this industry.

<i>Item</i>	<i>Dollars (billions)</i>
Total consumption expenditures.	\$8.1
Expenditures, excluding taxes	4.4
Production	1.2
Manufacture	1.5
Distribution	1.7
Taxes	3.7
Federal	2.0
State	1.6
Local	.1

The health costs of smoking are felt throughout the country, since smoking is a widespread habit, but the revenues and employment from tobacco production and manufacture are regionally concentrated. For example, six large companies located in only three States (North Carolina, Kentucky, and Virginia) manufacture almost all the cigarettes in the United States. In terms of tobacco leaf, North Carolina and Kentucky produce more than 50 percent of the value of the total U.S. crop, although 13 States in all produce cigarette-type tobaccos.

Conclusion

As shown in table 3, the extrapolated health cost associated with smoking is \$5.3 billion for the United States. This sum is greater by 20 percent than the \$4.4 billion in total consumer expenditures, excluding taxes, for cigarettes in 1966. This estimate of the health costs of smoking is based on a number of very tentative assumptions, as I have shown.

Much research is needed to provide a firm estimate of the direct

and indirect economic costs of smoking for the United States. Such research may show, for example, that an accurate estimate of health costs is perhaps 50 percent greater or lesser than the figure extrapolated from the Canadian study. However, it is apparent that the magnitude of such costs is significant and justifies concern over the allocation of national resources to nonproductive and even harmful uses.

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